

*S. Warnstorffii* prefers damp or wet birch swamps, and the margins of elevated bogs when adjacent to birch-covered wet meadows; or it grows in springy swamps, here preferably in the society of *Paludella squarrosa* Ehrh. It is often found associated with *S. teres*, whilst it seems to shun the company of *S. tenellum* and the other species of the *Acutifolium* group.

This plant must surely be as widely diffused in Canada and the northern United States as it is in Europe, but hitherto, at all events, it has been overlooked or not specifically distinguished.

Var. **purpurascens** Russ. in litt. The upper part of the plants of a beautiful rose, purple or violet-red, below usually paler; with this color no green is intermixed.

N. Hampshire, Franconia, 1,000 to 1,500 ft., Lisbon, 800 ft.; Vermont, W. Burke, 1,000 ft.; Mass., N. Adams, 1,500 ft. (*Faxon*); Danvers, 100 ft. (*Sears*).

Var. **versicolor** Russ. in litt. Color of tufts a mixture of red and green; coma usually pale, rose, purple or violet-red, the middle part of the plant green or greenish, the lower part bleached out.

N. Hampshire, Franconia, 2,000 ft.; Vermont, Westmore, 1,000 ft.; Mass., Mt. Graylock, 1,500 ft., Brookline, 100 ft. (*Faxon*).

Var. **viride**, Russ. in litt. Color throughout green or greenish, with here and there a delicate flush of pale red; lower part of stem faded out.

Vermont, Willoughby Lake, 1,100 ft.; Mass., Mt. Graylock, 1,500 ft., Dedham, 75 ft. (*Faxon*).

*Neuruppin, Germany, Feb. 6, 1890.*

## Notes on the flora of the Lake Superior region. I.

### I. THE NORTHERN PENINSULA OF MICHIGAN.<sup>1</sup>

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During the summer of 1889 a few weeks were spent in collecting and studying the flora of the Lake Superior region, with a brief stay on the way back at St. Croix Falls and Che-sago Lake in eastern Minnesota. About two hundred species of plants were secured and have been critically exam-

<sup>1</sup> Read before the State Microscopical Society of Illinois, April 25, 1890.

ined, either new to me or interesting for study and preservation. The collecting season lasted from July 10 to September 6. The localities visited were the Marquette iron region, extending from the west end of Lake Michigamme to the city of Marquette, a part of Keweenaw Peninsula in the copper region of Portage Lake and vicinity; and a portion of the iron region of Vermilion Lake, at Tower, Minn., with the addition already mentioned in eastern Minnesota. Strictly speaking the district about Vermilion Lake is not a part of the Lake Superior country, as it belongs to that which drains northward into Hudson's Bay. But in the language of the miners and lumbermen, who carry on its two principal industries, it is included, since its commercial outlet is Lake Superior. A large part of the Marquette iron district is also exterior to the basin of Lake Superior, belonging to that of Lake Michigan, but is included for a like reason.

One of the principal objects in visiting these localities was the comparative study of the flora of Lake Superior and that of Lake Michigan. As far as the latter lake is concerned, my work in past years has been distributed in such a way as to be made continuous with its length with immaterial exceptions. Its north and south direction furnishes an opportunity to study plants varying from those of middle temperate to the sub-alpine.

In the summer of 1883 several weeks were employed in a similar way in the Menominee iron region, and the most important results were published soon after in the *BOTANICAL GAZETTE*. It is only a little farther to the Marquette district. We are there at the head waters of the Escanaba and the Michigamme, the main branch of the Menominee, which chiefly drain it, and pass southward into Lake Michigan. Dead river and Carp river, that go eastward into Lake Superior, are but minor streams. All the collecting in the Marquette district, except immediately around the city of Marquette, was about the head waters of these streams. Here is the highest part of the basin of Lake Michigan, Michigamme Lake being more than a thousand feet above its level. It is only a few miles beyond to the watershed of Lake Superior, formed by the low ridge of the Huron Mountains, about 1,800 feet above sea-level, and the highest land in Michigan. Short streams come down their southern slope to the Escanaba and Lake Michigamme, the Bi-ji-ki being the largest one. The Escanaba rises close by, the eastern affluent of the lake being a mere brook barely a mile in length. Hard

ridges of granite and diorite and the schists of the Huronian and Laurentian formations turn the Escanaba eastward at first, while the Michigamme cuts across them to the south, forming a series of rapids and waterfalls. Swamps, small lakes and ponds abound among the hills, and the aquatic and semi-aquatic vegetation, as well as that characteristic of the forest and cliffs, is abundant and varied.

Lake Michigamme, near which a fortnight of the time was spent, is one of the larger lakes of the Northern Peninsula, being about six miles long and from one to three wide, with a large arm stretching southward. It is quite irregular in form and has several beautiful islands, mostly masses of dome-shaped rock covered with trees, which make it one of the most picturesque of these lakes. Great ledges of rock frequently abut on its northern shore, the southern being a graded slope clothed with timber.

Much of this region has been overrun by fire, as the bare and blackened trunks in the fields and woods witness. Much of what the fire spared has fallen before the axe of the lumberman and the charcoal burner, for the demands of the iron industry have made large inroads on the hardwood timber. Abandoned furnaces and coal-pits show that this part of the industry has gone elsewhere, and there are but few smelting works in operation in the Marquette district. Coal has supplanted wood, and commercially it is found more economical to take the ore to the coal than to bring the coal to the ore. But it has often left a scene of desolation which nature is trying to hide, and will eventually succeed in doing, if the fires are kept away, by reforesting the desolated tracts. Some of the better land along the streams and smoother uplands is taken for agriculture and will be increasingly appropriated, and one comes upon farms now and then in a fair state of cultivation. But much, from its very ruggedness, must always remain for woodland, or should be left for this purpose on account of the greater profit to be derived from it. And here the problem of wise forestry regulations comes in for solution, one of the most important economical questions of the immediate future. It can not be taken in hand too soon for the good of the states interested, and the welfare of those who shall come after us. It will take a century or more to replace but partially the woodlands, that by proper management might still have been a paying investment. Here the greed of man has overreached itself, and the desire of large and rapid gains has wrought untold mischief. Happily

there can be reparation, but the process will prove a long and costly one, enforcing the lesson that there is no gain in the end in tampering with the wise provision of nature.

I shall mention in this article those plants only that seem most important botanically, either by variations, habitat, or other conditions. One of the first discovered, as well as most interesting on account of its locality, was found near the Champion mine. Having examined this extensive mine the morning after reaching the place, and seeing a piece of swampy land just south of it, into which the waste rock from the mine is thrown and its water pumped, I went down to find what might be detected there. Growing in patches on the wet stones and soil was a moss-like plant, an inch or two high, which, on inspection, was seen to belong to the Pink family, but just what was not evident at sight. When identified it proved to be a specimen of *Sagina procumbens* L., in this seemingly out-of-the-way place. It grew in plenty in this locality, but was met with nowhere else about the upper lakes. Its main interest arises from the fact that, as represented in the flora of North America, it has heretofore been found on the Atlantic border, being essentially a coast plant, ranging from Greenland to Pennsylvania. Hence it adds another to the list of plants occurring along the Atlantic borders and in the basin of the Great Lakes without intermediate stations. It is a plant widely diffused in the northern parts of the Old World, being common to Europe and Asia, and, according to Sprengel, found in pastures in northern Africa. In the eastern continents it is a dry-land or pasture plant. Torrey, in his "Flora of the Northern and Middle Sections of the United States,"<sup>2</sup> has this remark upon it: "The habitat of this plant differs from the European species, which occurs in dry soil. In every other respect they agree precisely." Gærtner<sup>3</sup> figures a stem of it in his work on the fruits and seeds of plants, and a sprig of that found at Champion might have been employed for the drawing, as it agrees precisely.

*Convolvulus spithameus*, as found in this region, takes a form somewhat different from that further south. It was noticed by its prominent white flowers along the railroad from Green Bay northward, and recognized as of the morning glory kind, but not identified from the car windows with the plants seen in fields beside the Kankakee and Calumet rivers. The latter generally have decumbent stems one or

<sup>2</sup>p. 195.

<sup>3</sup>De Fructibus et Seminibus Plantarum, 1791, Vol. II, tab. 129.

two feet long, but the northern plant grew nearly or quite erect, with a stem but two to six inches high, and the flower so near the ground as seemingly to rest upon it. The effect was very pleasing when they were massed, as they sometimes were, especially on dry knolls in the newly cleared fields, the ground being spangled with the white blossoms so much more prominent than the stems.

The Virginian Lungwort further south seems here to be replaced by *Mertensia paniculata* Don., near enough like it to be at once recognized as a *Mertensia*, but with a look a little unfamiliar. This is not a smooth plant, and is more slender than *M. Virginica*, with ribbed leaves of a different pattern, but it has the same pale-green, sleek appearance. It grows in the margin of rocky woods and did not seem abundant.

*Hieracium scabrum* frequently had a character which somewhat belied its specific name, the leaves being quite smooth and the stem mainly so except the dark glandular bristles near the top and upon the flowers. It was of a stout form, a foot or two high, growing in the dry open grounds and open woods. I found it first at Humboldt, and afterward at Negaunee and Marquette, always in the same dry, open localities.

*Krigia amplexicaulis* Nutt. (*Cynthia Virginica* Don.) was common in damp ground, sometimes taking to the hummocks in the bogs, and it occasionally had lower leaves lyrate-pinnatifid. It affects much dryer situations in the prairies and sands about Chicago, where it may sometimes be found in company with *K. Virginica*.

But one more member of the Compositæ needs be mentioned, an anomalous form of that "most polymorphous species," *Senecio aureus*. It was a rayless form of an otherwise nearly typical plant. In some respects it resembled the var. *borealis* Torr. & Gray, of British America and some parts of the Rocky and Sierra Nevada Mountains, but it is a taller plant and with the stem leaves divided as in the common form. The radical leaves are thick, almost succulent, purple beneath, spatulate and serrate with long petioles. It is a prominent plant in open grassy spots of peat bogs, from one to two and a half feet high, and was mainly found along the railroads, being traced from the north shore of Lake Michigamme to the neighborhood of Humboldt, and was not seen elsewhere. The heads are numerous, corymbose, or cymose-umbellate, of a saffron or orange color, and all that

were examined, which was done in many plants, were without rays. Pursh (Flora, p. 529), under *S. elongatus*, describes the form very well as far as characters are given. He says it resembles *S. Balsamitæ*, "but is destitute of a ray." As the latter, being a variety of *S. aureus*, is common in the prairies about Chicago, the resemblance of the northern plant to it had been remarked, though this is rather taller than the var. *Balsamitæ*, and destitute of its prominent rays. The plant has also the thick leaves of var. *obovatus* Torr. & Gray. Pursh's *S. foliosus* is placed in the "Synoptical Flora" under var. *borealis*, with the range given above. Pursh designates as the habitat of his plant "rocks near the banks of rivers," and the special locality he mentions is "Easton, Penn." Evidently this northern plant, though referable to the type, partakes of the specific characters of two or three of the varieties.

Among the plants growing in bogs may be mentioned *Geum rivale*, tall and striking by reason of its large purple flowers and heads. *Drosera rotundifolia* was found near Marquette with branching scapes, they being almost always simple. And in the same locality three sports among Orchids were seen, a family that seems somewhat inclined to teratological vagaries. One was the common *Calopogon pulchellus* with a second linear leaf nearly opposite the usual single leaf it bears, but smaller; another was *Habenaria lacera* with a flower having three spurs and two lips, one of the lips again dividing as if to maintain the tri-formity. Two columns were also present. *Pogonia ophioglossoides* with a radical leaf on a long petiole was the third case. It is the second time I have seen this peculiarity, having found a similar form at Pine, Ind.

Another Orchid, *Corallorhiza innata*, remarkable for the size of the plants, being from 12 to 14 inches high, grew in the shade of hemlocks by the borders of Teal Lake, Negaunee. It is generally a slender plant but 4 to 8 inches high.

Of shrubs may be noticed a species of honeysuckle, mainly northern in range, *Lonicera hirsuta* Eaton, that grows on rocks and in moist sandy ground. It usually forms a climbing bush, sometimes to the height of 20 or 30 feet, or more, but specimens found on the "Granite Range," north of Champion, were of a trailing habit for the lower part of the stem, the upper part rising from 15 to 24 inches. The species often shows little more tendency to climb than *L. glauca*, the low shrubs being nearly upright, or partly sup-

ported by neighboring bushes. I have always found it rather small in the region of the upper lakes. The plants were also peculiar in their flowers, yellow changing or fading to red. This also links them to *L. glauca*, whose flowers are greenish-yellow to purple, commonly purple in this vicinity. Our common American Woodbine, *L. grata*, also has flowers changeable in color, but it is the reverse, fading from purplish to yellow. *Rubus Nutkanus* Mocino, or, if we are able to take the name of Nuttall, *R. parviflorus*, grows everywhere on the rocky hills that have been denuded of trees, and in clearings, often thickly covering the ground like other species of bramble. It is usually smaller than its congener, *R. odoratus*, common at the east and also found in the Upper Peninsula, and bears a fruit fragile but palatable. Birds are apparently very fond of it.

The hazelnut of the Northern Peninsula, or at least of the northern part of it, is *Corylus rostrata*, well marked by the long beak of the involucre. It was very abundant in some parts of the Keweenaw Peninsula. When at Sault Ste. Marie, in 1881, it was found to be the prevailing species there on the Canadian side.

Some of the aquatic plants deserve notice. *Hippuris vulgaris* is not so rare a plant as it was formerly thought to be, but is frequently met with in the region of the upper lakes. It is rather local, but quite widely disseminated. It proves itself a plant readily conforming to a change of condition in its usual habitats, becoming semi-aquatic or even terrestrial if the water dries away or recedes from the shore, doing well except being dwarfed in size. I saw a good example of this in a mill-pond at Otis, Ind., last autumn. The water was low and had withdrawn to a distance from its usual limit. A wide reach of muddy flats was left, green with *Hippuris*. The stems were too slender to stand upright, evidently having grown at a higher stage of water, and leaned over to one side, the extremity, well covered with flowers and fruit, moving upward into an erect position. At Tower, Minn., it was found in a terrestrial form, growing with *Polygonum Muhlenbergii* Watson, and *Ranunculus multifidus* var. *terrestris*. This terrestrial habit had been noticed before in plants in the Menominee iron region. Though regarded as a plant with a simple stem, it is not always so. Some tall plants with stems bearing two or three branches were taken from the borders of Bi-ji-ki river, near Michigamme Lake.

It is not always easy to determine at sight which of our

two white water-lilies one may have in hand when he picks a blossom from its stem, nor convenient to "go to the root of the matter to see," one of the chief characteristics being so radical, but generally those seen in the Northern Peninsula were designated *Nymphaea reniformis* (*N. tuberosa* Paine), judged by the flowers and other marks when compared with those common in all our waters. In fact, I have never found an undoubted example of *N. odorata* about Chicago, although it is said to grow here. When the parts underground are examined they prove to be tuber-bearing. The shape of the leaf is unreliable. And so it was in northern Michigan. The plants grew in great abundance in Goose Lake, near Negaunee, the flowers were pretty large, with but little odor, and the roots bore the characteristic tubers. When botanizing at Petoskey, in 1878, some plants of *N. odorata* were collected in a shallow lake, having rather small very sweet-scented flowers, like those common in New England. It doubtless occurs throughout these northern regions, as it is said to be abundant in northern Minnesota and British America, but the Petoskey specimen as yet remains my only undoubted case.

Species of *Potamogeton* were particularly sought after, both for studying their variations and geographical distribution. On the whole they show considerable variation, and the published descriptions need some changes or enlargements to facilitate easy determination by those not specially versed in the group. *P. rufescens* is naturally looked for in the north, where the waters or climate seem more congenial to its growth, and was seen in several places. In the summer of 1888, while passing a month in studying the flora of the lower Saguenay, it was seen to be the most common species in the clear, cold waters of the trout lakes and streams about Chicoutimi and Tadousac. *P. amplifolius* and *P. Pennsylvanicus* are still more common in the Lake Superior region, the former particularly of wide distribution and abundant in places. *P. amplifolius*, with branching stems, is not uncommon throughout the lake region, and this distinction between it and *P. Illinoensis* will not hold. Then we find it has pointed, bi-carinate stipules.

*P. Robbinsii* was met with twice, first in a pond at Republic, and afterward at the outlet of Goose Lake, south of Negaunee. Later in the season it was again seen in great quantities in Chesago Lake, Minn. Hence, I conclude that it is more widely spread in our northern regions than has



hitherto been suspected. It is not mentioned in the floras of these sections as far as they are at hand. The farthest west and north where I had found it before was Cedar Lake, in northern Indiana. As it is known to occur on the north shore of Lake Superior and in the Rocky Mountains and on the Pacific slope, it is probable that the intervening region may be occupied by it, and that it will ultimately be found to extend across the continent. It is easily overlooked, being almost always completely submerged, and if the water is not clear may escape detection. I have sometimes been made aware of its presence in the water only by dredging. Wherever seen, it proves one of the best marked and least variable species of the genus.

*P. heterophyllus* Schreb., under two extreme forms of type, was collected. It is extremely variable, and, if the characters were based on foliage alone, one might think he had found two different species. Two of the gatherings were of special interest on account of the variability of the floating leaves, both from the Keweenaw Peninsula. One, from pools and sloughs near the northern end of Portage canal, has large floating leaves, some of them  $1\frac{1}{4}$  inch wide by  $1\frac{1}{2}$  inch long, and 18-nerved. The leaves of the species usually end in a short mucro, or they may taper to an abrupt point ending in a mucro, but on these specimens some leaves were pointless, complete ellipses, very symmetrical in outline, the base and apex of the same shape. I have found plants with leaves of similar shape, as large as these or even larger, but they all possessed the characteristic mucro. Some of these plants had become partly terrestrial by the water drying up, which is frequently the case with this species. It grows very well in wet sand or mud, with prostrate stems three to six inches long, the leaves being crowded into a kind of tuft at the end. It is more tenacious of life than most Potamogetons, which commonly perish if the stems are not immersed. The other form, found in pools and ditches near Calumet, approached the var. *graminifolius*, but with shorter immersed leaves and larger floating ones. These were long, narrow and acute, or more often acuminate, lanceolate in outline, the largest nearly three inches long by  $\frac{3}{8}$  inches wide, and the smaller in proportion. The petioles were also very long and slender. All tapered in such a way that the mucro had disappeared. I have seen the same shape of leaf in plants near Chicago along with the ordinary kind, but not characterizing the en-

ture plant as in this case. The submersed leaves were also somewhat long and tapering, as in var. *graminifolius*, but the stems had the habit of var. *myriophyllus*, rooting extensively and sending up frequent branches. The stipules, too, partook of the tapering character, being barely obtuse, or sometimes acute. But the fruit in both forms is identical and typical.

*P. heterophyllus*, as may be seen in the above case, furnishes a good illustration of one mode of working with a polymorphous species, and shows how easy it is to be led to make varietal distinctions which do not definitely hold, but frequently add to the confusion in which the student is placed. Having collected or seen this plant in many stations and numerous examples both in the west and east, I have generally found that a search among a number of plants of the same locality, and sometimes an examination of the leaves on the same stem, will show transition forms—those shapes characteristic of one extreme being sparsely represented on plants whose prevalent shapes are of the other extreme. There is a tendency, however wide the variation, to adhere to a common type, which may be eliminated by patient study. I have often found many of the varietal designations of botanists more bewildering than helpful, for connecting links are quite sure to appear which are just as hard to assign among the varieties as to the type. It would seem the better way to enlarge the specific description so as to cover all but very pronounced and constant varieties, and do away with some of the hair-splitting that is not a gain to science. In fact, we find in variable plants something to remind us of the theory of the great German artist of the renaissance, Albrecht Dürer, which he advanced in regard to the measurement of the human body. It was in substance that as every individual varies from the typical man in a way peculiar to himself, these variations will, in an infinite number of measurements counteract and destroy each other, and the type will be found. It might be well for the makers of species to bear this in mind and consider as one those whose characters overlap too far and which can not be differentiated with a fair degree of definiteness.

*Englewood, Ill.*